Please cancel previous claims 12 and 17.

REMARKS

Claims 10-18 were rejected under 35 U.S.C. 103(a) as being unpatentable over Lawrence et al. (U.S. Patent No. 4,526,633) in view of Engsbraten (U.S. Patent No. 5,271,779), Waldock (U.S. Patent No. 4,959,108), and Conrad (U.S. Patent No. 3,642,547). The above amendment obviates this rejection. Method claim 10 now requires that (1) the emulsion blasting agent comprise an aqueous inorganic oxidizer salt solution forming in droplet form a discontinuous phase and an organic liquid fuel forming a continuous phase (see support for this language, for example, in nonelected claim 19); (2) the energy-reducing agent be selected from the group consisting of water and aqueous solutions; and (3) the energy-reducing agent be mixed uniformly and homogenously into the emulsion blasting agent to form a second discontinuous phase. Amended claim 10 is neither disclosed nor implied in the cited references, alone or in combination.

As explained on page 5 of Applicants' specification, the water or aqueous solution energy-reducing agent is added to the emulsion blasting agent in an amount sufficient to reduce significantly its energy and is mixed uniformly and homogenously throughout the emulsion phase. "In fact, when mixed in this manner the water or aqueous solution forms a second discontinuous droplet phase to that

formed by the initial oxidizer salt solution component. This second discontinuous phase renders the emulsion blasting agent more sensitive and stable than if the water or aqueous solution were combined initially with the inorganic oxidizer salt solution or if they were not mixed uniformly and homogenously throughout the emulsion phase." (page 5)

The Examiner cites Lawrence et al., col. 1, lines 45-54, as teaching the basic idea of varying the composition (a "slurry blasting agent") as it is being made and pumped into a borehole. Later, Lawrence et al. disclose adding dry ingredients to an emulsion phase (col. 2, lines 55-59). Lawrence et al. do not disclose adding a water or aqueous solution energy-reducing agent in the claimed amount and then mixing the water or aqueous solution uniformly and homogenously into an emulsion blasting agent to form a second discontinuous phase. Engsbraten discloses the use of porous, non-aqueous, bulk fillers (solids) as his energy-reducing agent. Once combined with an emulsion phase, the mixture becomes non-pumpable. Further, the emulsion phase in Engsbraten is used in an amount only sufficient for improving adherence between the particulate oxidizer salt and the particulate filler. Waldock similarly uses an inert bulking agent to vary the energy in his composition. This inert, solid bulking agent behaves as an energy diluent, decreasing the "shock" energy by absorbing heat and not providing additional work energy during detonation. In contrast, the present invention utilizes an aqueous energy-reducing agent

that similarly decreases the "shock" energy by absorbing heat, but the energy-reducing agent then becomes a superheated gas that contributes to the work energy and thus ability to move the fractured burden.

Conrad discloses the varying of density by the addition of a gas stream. Thus Conrad uses gas rather than water or an aqueous solution as his energy- and density-reducing means.

The other prior art made of record but not relied upon similarly is deficient with respect to the present invention. For example, Chrisp discloses the addition of small amounts of a gas-generating substance. Tag et al. disclose an emulsion explosive containing chemical or solid density reducing agents, wherein the content of water consists of water of crystallization bound to calcium nitrate. Curtin et al. disclose a process for chemically gassing an emulsion explosive under pressure. Prest et al. disclose yet another approach to chemically gassing an emulsion explosive. Cechanski discloses a method for forming an explosive composition comprising a specified emulsifier. Segura et al. disclose a method of mechanically gassing an emulsion. In this other art made of record, limited energy reduction results as mechanical or chemical gassing occurs (due to a lowering of density) but not to the extent achieved by the method of the present invention, which requires the addition of the energy-reducing agent in addition to a chemical gassing agent.

It is not obvious to a person having ordinary skill in the art that an emulsion blasting agent would retain its detonability when an energy-reducing agent in the form of water or an aqueous solution is added to an already formed emulsion blasting agent. Heretofore, the inclusion of this amount of water or aqueous solution, such as may occur when the blasting agent encounters water in a borehole, has been found to be a major factor in detonation failures. Applicants have found that by mixing this high amount of water or aqueous solution uniformly and homogenously into the emulsion blasting agent to form a second discontinuous phase, the emulsion remains reliably detonable. For example, Mix 4, described on page 12 of the specification, and in Tables 1 and 2 on page 13, remained reliably detonable even when its volume energy was reduced by about 55% and as much as 20% by weight water was added (and mixed uniformly and homogenously into the composition).

In view of the foregoing, Applicants respectfully request allowance of the claims as amended.

Respectfully submitted,

Robert A. Bingham (Reg. No. 26,530)
Attorney for Applicants
DYNO NOBEL INC.
Eleventh Floor Crossroads Tower
Salt Lake City, Utah 84144
Telephone: (801) 364-4800

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ATTACHMENT 1

10. (Amended) A method of reducing the energy of an emulsion blasting agent as it is being loaded into a borehole comprising the steps of:

a) selecting an emulsion blasting agent comprising an aqueous inorganic oxidizer salt solution forming in droplet form a discontinuous phase and an organic liquid fuel forming a continuous phase;

b) conveying the emulsion blasting agent;

c) adding an energy-reducing agent to the emulsion blasting agent as it is being conveyed wherein the energy reducing agent is selected from the group consisting of water and aqueous solutions;

d) mixing the energy-reducing agent uniformly and homogeneously into the emulsion blasting agent to form a second discontinuous phase in an amount of from about 5% to about 22.5% by weight of the emulsion blasting agent;

e) adding gassing agents to the emulsion blasting agent to reduce its density and increase its sensitivity; and

f) loading the conveyed emulsion blasting agent into a borehole.

ATTACHMENT 2

10. A method of reducing the energy of an emulsion blasting agent as it is being loaded into a borehole comprising the steps of:

a) selecting an emulsion blasting agent comprising an aqueous inorganic oxidizer salt solution forming in droplet form a discontinuous phase and an organic liquid fuel forming a continuous phase[of pre-determined formulation];

b) conveying the emulsion blasting agent;

c) adding an energy-reducing agent to the emulsion blasting agent as it is being conveyed wherein the energy reducing agent is selected from the group consisting of water and aqueous solutions;

d) mixing the energy-reducing agent uniformly and homogeneously into the emulsion blasting agent to form a second discontinuous phase in an amount of from about 5% to about 22.5% by weight of the emulsion blasting agent;

e) adding gassing agents to the emulsion blasting agent to reduce its density and increase its sensitivity; and

f) loading the conveyed emulsion blasting agent into a borehole.